$\left[\tan^{-1}\frac{2x}{2-x^2}\right]_{x=\infty}=\tan^{-1}0=\pi$, since the integrand has increased and passed through ∞ for $x=\sqrt{2}$.

Also solved by *G. B. M. ZERR*.

MECHANICS.

144. Proposed by G. B. M. ZERR, A. M., Ph. D , Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

Pressure is applied perpendicularly to the plane surface yz, bounding an otherwise infinite isotropic solid. Find the resultant displacements, if the pressure varies as $\sin\left(\frac{2\pi y}{a}\right)+\sinh\left(\frac{2\pi y}{a}\right)$.

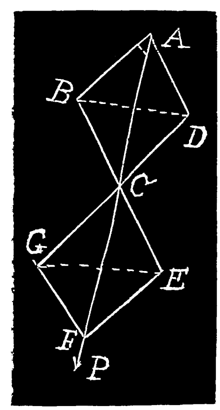
No solution of this problem has been received.

145. Proposed by W. J. GREENSTREET, M. A., Editor of The Mathematical Gazette, Stroud, England.

ABCD, *GCEF* are equal parallelograms, *DCG* and *BCE* being straight lines. If the figure be considered as formed of smooth light jointed bars and if *BD* be a light rod, and the whole be suspended from *A*, find the stress in *BD* if a weight be hung from *F*. Also find the stress if a light rod *GE* replace *BD*.

Solution by G. B. M. ZERR, A.M., Ph.D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

Since the bars are light we can disregard their weight. Let P be the weight. Then by virtual work



$$Pd(AC)+Sd(BD)=0\ldots.(1).$$

But $AC^2+BD^2=2AD^2+2DC^2$.

$\therefore AC d(AC)+BD d(BD)=0\ldots.(2)$.

From (1) and (2),

$$\frac{d(AC)}{d(BD)}=-\frac{S}{P}=-\frac{BD}{AC}.$$

$\therefore S=\frac{P.BD}{AC}$. Similarly for GE.

$S_1=\frac{P.GE}{CF}$. The stress is the same for both.

146. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

A diffraction grating, with lines .05 mm. apart is held in front of a Bunsen's burner in which common salt is volatilized, and, when viewed through a telescope it is found that the angular distances of the first, second, third, fourth, fifth, and sixth bright bands from the central one are respectively 41′, 1°21′, 2°2′, 2°42′, 3°23′ and 4°3′. Required the wave length of sodium light.

Solution by M. E. GRABER, Graduate Student, Heidelberg University. Tiffin, Ohio, and the PROPOSER.

Let λ=wave length, d=distance apart of grating, θ=angular distance, n=order from central one. Then $\lambda=d\sin\theta/n$.

$$\frac{.05\sin 41'}{1}=.000596305\text{mm.},\quad \frac{.05\sin 1^\circ 21'}{2}=.000588995\text{mm.},$$

$$\frac{.05\sin 2^\circ 2'}{3}=.000591348\text{mm.},\quad \frac{.05\sin 2^\circ 42'}{4}=.000588831\text{mm.},$$

$$\frac{.05\sin 3^\circ 21'}{5}=.000590160\text{mm.},\quad \frac{.05\sin 4^\circ 3'}{6}=.000588558\text{mm.}$$

λ=the mean of these six. $\therefore \lambda=.0005906995$mm.

DIOPHANTINE ANALYSIS.

99. Proposed by the late HON. JOSIAH H. DRUMMOND, LL. D.

If p and q are such values of x and y as fulfill the conditions $x^2\pm y^2-1$=a square, find, in terms of p and q, the expression for an indefinite number of other values.

Solution by G. B. M. ZERR. A.M., Ph. D., Professor of Chemistry and Physics, The Temple College, Philadelphia, Pa.

$x^2\pm y^2=a^2+1=b$, or $\dfrac{x^2}{b}\pm\dfrac{y^2}{b}=1$.

Let $x=p$, and $y=q$ be a solution. Then $(p^2/b\pm q^2/b)^n=1$.

$\therefore$ $[x/\sqrt{b}+y\sqrt{(\pm1)/b}][x/\sqrt{b}-y\sqrt{(\pm1)}/\sqrt{b}]=[p/\sqrt{b}+q\sqrt{(\pm1)}/\sqrt{b}]^n$ $\times[p/\sqrt{b}-q\sqrt{(\pm1)}/\sqrt{b}]^n$.

Put $x/\sqrt{b}+y\sqrt{(\pm1)}/\sqrt{b}=[p/\sqrt{b}+q\sqrt{(\pm1)}/\sqrt{b}]^n$.

$x/\sqrt{b}-y\sqrt{(\pm1)}/\sqrt{b}=[p/\sqrt{b}-q\sqrt{(\pm1)}/\sqrt{b}]^n$.

$$\therefore x=\frac{\sqrt{b}}{2}\{[p/\sqrt{b}+q\sqrt{(\pm1)}/\sqrt{b}]^n+[p/\sqrt{b}-q\sqrt{(\pm1)}/\sqrt{b}]^n\},$$

$$y=\frac{\sqrt{b}}{2\sqrt{\pm1}}\{[p/\sqrt{b}+q\sqrt{(\pm1)}/\sqrt{b}]^n-[p/\sqrt{b}-q\sqrt{(\pm1)}/\sqrt{b}]^n\}.$$

By ascribing to n the values 1, 2, 3, ..., as many solutions as are desired can be obtained.

100. Proposed by A. H. BELL, Hillsboro, Ill.

Prove that every indeterminate equation of the second degree can be reduced to $x^2-Ay^2=Bz^2$. [*Legendre.*]

Solution by L. C. WALKER, A. M., Graduate Student, Leland Stanford Jr. University. Cal.

Let $ax'^2+2hx'y'+by'^2+2gx'+2fy'+c=0$ represent any determinate equa-